REMARKS

Applicants thank the Examiner for carefully considering the subject application. Applicants respond to the issues under 35 U.S.C. §§ 112 and 103 raised by Office action mailed December 12, 2003 as follows.

I. Issues Under 35 U.S.C. §112, second paragraph.

The Examiner has pointed to claims 41, 42, 43 and 62 as lacking proper antecedent basis. Applicants have amended these claims to correct several typographical errors. Applicants therefore respectfully submit that the issues raised by the Examiner are now moot.

II. Issues Under 35 U.S.C. §103

II.A. Claim 36

The Examiner has applied two combinations of references under 35 U.S.C. §103(a) to claim 36. Specifically, the Examiner has applied:

(i) Baron et al. (U.S. 4,401,052) in view of Kushiya et al. (U.S. 6,092,669); and

(ii) Baron et al. (U.S. 4,401,052) in view of Hedström (U.S. 5,445,973).

Applicants disagree with the application of these references to the pending claims, and will deal with each alleged combination in turn. However, before describing the reasons in detail, applicants believe it may be helpful to briefly review some background information from the specification and pending claim 36, as well as the basic combination of references asserted by the Examiner.

Specifically, the present application relates generally to the field of thin-film deposition and photovoltaics (PV). One example embodiment described in the specification focuses upon structure which is designed to deliver, into a thin-film layer-

deposition zone in a deposition chamber, and by way of one or more flow-forming nozzles, a billowing plume (or plural plumes) of vapor derived from a suitable pool of molten deposition material, such as, in the case of PV-cell technology, copper, gallium, indium and/or selenium. This structure, in the particular PV-cell technology-field, functions in a multi-nozzle, cooperative, plume-generating array to generate a unique vaporous deposition fog which includes an appropriate co-mingled mix of the selected group of these just-above-identified materials -- selected, of course, in accordance with the particular "form" of layer which is to be produced. This approach enables, in the context of producing a PV-cell device, employment of but a single, dedicated processing chamber, and within that chamber, but a single, deposition-step "pass-through", to create a particular complex material layer in a (relatively) simple, economical, space-saving and technically satisfying, unified operation.

Claim 36, claims:

> A vapor deposition effusion system, comprising:
> a device configured to translate a strip material through a deposition zone and along a processing path, each of the strip material and the deposition zone having a width oriented perpendicular to the processing path and a length oriented parallel to the processing path; and
> first and second substantially closed vessels located serially along the processing path, each vessel containing a heated quantity of a different source material, the first and second vessels being configured to produce overlapping plumes of the different source materials in the deposition zone, each vessel including an array of vapor delivery nozzles distributed uniformly across the vessel in a direction corresponding to the width of the deposition zone and configured to expel overlapping plumes of source material, so that a fog of source materials is created and deposited on the strip material in the deposition zone, the fog having a substantially uniform composition across the width of the deposition zone and a varying composition across the length of the deposition zone.

Turning now to the Office action, it relies on Baron et al. as the primary reference, stating at pages 2-3 that:

> Baron et al shows a vapor deposition diffusion system for making solar cells having a substrate strip moving through an evaporation chamber with three serially located heated manifolds made of graphite or boron nitride including substantially closed vessels where each manifold has an array of vapor delivery nozzles creating a fog to uniformly deposit the source material to the substrate strip. However, Baron et al does not disclose that each manifold contains different source materials in their respective vessels.

To remedy the admitted deficiency of Baron et al., the Examiner states at page 3:

> Kushiya et al or Hedstrom shows providing three different source materials such as copper, gallium and indium for sputtering or depositing the source materials to a substrate when making solar cells. In view of Kushiya et al or Hedstrom, it would have been obvious to one of ordinary skill in the art to adapt Baron et al with each manifold having different source materials to make solar cells that are high in light absorbing.

Turning now to the details, applicants present various example reasons why the application of these references to the pending claims is improper.

II.A.i The proposed combination of Baron et al. in view of Kushiya et al. fails to establish a prima facia case of obviousness since no motivation for combining the references has been established by evidence of record.

Even assuming the references show that which the Examiner alleges, applicants respectfully submit that no proper motivation for combining the references has been

established. As summarized above, the Examiner's asserted motivation for combining the references appears to be that by adapting Baron et al. with manifolds having different source materials, this would make solar cells that are high in absorbing light. However, applicants have reviewed both Baron et al. and Kushiya et al. and can find no teaching that adapting Baron et al. in such a way would increase light absorption. Further, applicants can find not even a hint in either reference of how using different source materials in overlapping plumes with a device configured to translate a strip material through a deposition zone can provide increased performance. Rather, the only disclosure of such a system and the corresponding advantages thereof is found in applicants' specification. Applicants therefore respectfully submit that it is likely the Examiner has inadvertently used hindsight in selecting and combining these references, and the rejection should be withdrawn. See MPEP § 2143.01

Another reason that points away from the combination of Baron et al. and Kushiya et al. is that these references deal with different types of substrates. As noted in Baron et al. at col. 1, ll. 18-22, it deals with thin films that are flexible. Kushiya et al., on the other hand, describes a process that uses a glass substrate (see col. 5, ll. 15-16) that is presumably inflexible.

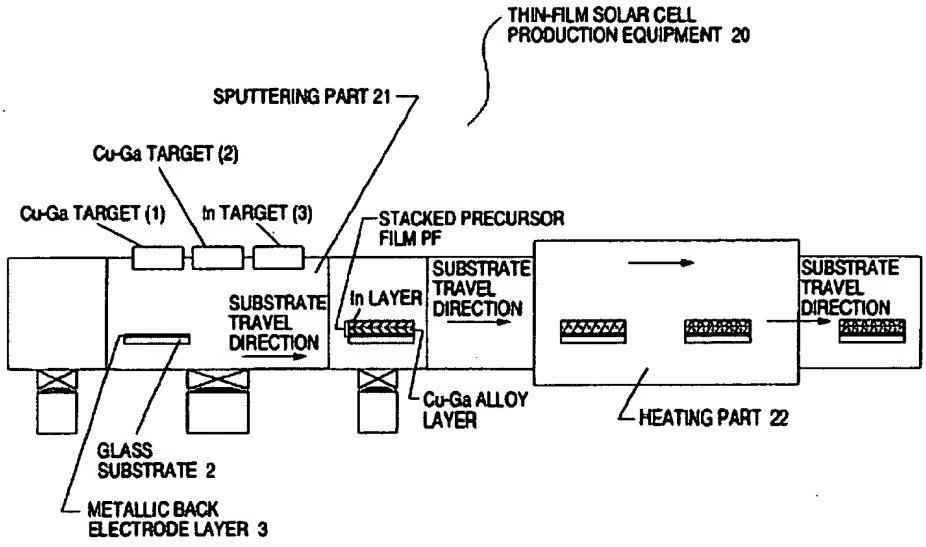
These are but several reasons why the combination urged by the Examiner should be withdrawn.

II.A.ii The proposed combination of Baron et al. in view of Kushiya et al. fails to establish a prima facia case of obviousness since the combination of reference fails to show all claimed limitations.

Even assuming the references are combined, applicants respectfully submit that there is still no disclosure of serially located vessels configured to produce overlapping

plumes of different source materials. As the Examiner has admitted, such disclosure cannot be found in Baron et al. Further, the Examiner has failed to point to any specific disclosure in Kushiya et al. of such disclosure. Applicants have reviewed Kushiya et al. and can find nothing that shows serially located vessels configured to produce overlapping plumes of different source materials. While Figure 2 (reproduced below) appears to show Cu-GA targets 1 and 2, and In target 3, in sputtering part 21, there is nothing to indicate that overlapping plumes of different source materials are produced. As such, explicit claim limitations still cannot be found even if the references are combined.

FIG. 2 of
Kushiya et al.



As another example, applicants can find no disclosure of operation so that a fog of different source materials is created and deposited on the strip material in the deposition zone, the fog having a substantially uniform composition across the width of a deposition zone and a varying composition across the length of a deposition zone.

Again, the Examiner has failed to provide any specific reference to where this limitation can be found in the references.

Based on the foregoing, applicants respectfully submit that the rejection of claim 36 based on Baron et al. in view of Kushiya et al. should be withdrawn since all limitations must be shown by the combination. MPEP § 2143.03.

II.A.iii The proposed combination of Baron et al. in view of Hedström. fails to establish a prima facia case of obviousness since no motivation for combining the references has been established by evidence of record.

Here, not only has no proper motivation for combining the references been established, but these two references would in fact discourage a person skilled in the art from even attempting to combine them due to the disparate structures and processes used. However, before describing these arguments in detail, a brief review of Hedström may be useful.

Hedström describes a structure and process that axially moves the material sources while rotating a carrier device with the substrate as illustrated via Figures 2 and 3 reproduced below. Hedström states at col. 3, ll. 11-13 that "the substrate 1 is placed on an inner surface 11 of a rotatable, generally cylindrical carrier device 10." The rotation is indicated in Figure 2 with an arrow. Further, as described at col. 3, ll. 27-37, the sources (13, 14, and 15) are moved axially with respect to the carrier device, as indicated by arrow 20 in Figure 3. Finally, allegedly advantageous operation is achieved precisely because of this unique structure. Specifically, Hedström states at col. 3, ll. 61-67 that such advantages are achieved, "[b]ecause, in accordance with the invention, the CuInSe2-layer 3 is deposited by moving a copper source and an indium source at a

uniform speed axially through the carrier device 10 while rotating the carrier device 10 about its own axis..." These passages, taken in conjunction with the remaining disclosure of Hedström, make it clear that its unique rotating structure with axially moving source materials is a necessary and essential feature that enables the alleged successful operation.

Fig. 2

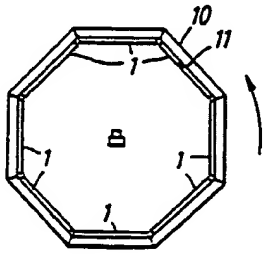
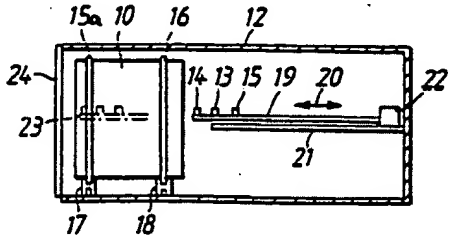


Fig. 3



Figs. 2 and 3 of Hedström

Applicants now turn to the Examiner's purported reasons for combining and modifying the references (i.e., to make solar cells high in absorbing light). First, applicants can find nothing in Baron et al. that suggests use of a rotating substrate carrier with axially moving source materials as in Hedström. Second, applicants can find nothing in Hedström which suggests adapting its rotating substrate approach to a system with fixed sources and a linearly translating substrate as in Baron et al. Baron et al. and Hedström are based on two fundamentally different types of manufacturing techniques, which, without more, appear totally incompatible. As stated above, the only disclosure of how to use overlapping plumes of different source materials serially located along a processing path with a device configured to translate a strip material through a deposition zone is found in applicants' specification. Thus, as above,

applicants respectfully submit that the proffered combination can only be based on hindsight, and therefore is improper.

Not only is there no evidence of record to support the asserted adaptation of Baron et al., but the disclosure of Hedström would likely discourage a person of ordinary skill in the art from taking the approach urged by the Examiner. As noted above, Hedström leads one skilled in the art to believe that its rotating structure with axially moving source materials is necessary to achieve its allegedly advantageous operation. And, as noted above, applicants can find nothing in Hedström which would give the ordinarily skilled person any reasonable expectation of successfully adapting the rotating Hedström approach with different source materials to the linear transportation system of Baron et al. To do so would render the system unsatisfactory for its intended purpose and completely change its principle of operation, and therefore is improper. MPEP § 2143.01.

Still another downfall of taking the approach urged by the Examiner is that the ordinarily skilled person would be faced with a quandary -- how to incorporate the axially translating source materials of Hedström into the fixed source material system of Baron et al. The references simply give no guidance as to how to answer this question, nor do they give any roadmap pointing in the direction of claim 36.

As such, the disclosure of Hedström undercuts the combination proposed by the Examiner, and also highlights the nonobviouness of claim 36.

II.A.iv The proposed combination of Baron et al. in view of Hedström. fails to establish a prima facia case of obviousness since the combination of reference fails to show all claimed limitations.

Even assuming the references are combined, applicants respectfully submit that there is still no disclosure of serially located vessels configured to produce overlapping plumes of different source materials. As the Examiner has admitted, such disclosure cannot be found in Baron et al. Further, the Examiner has failed to point to any specific disclosure in Hedström. Applicants have reviewed Hedström and can find nothing that shows serially located vessels configured to produce overlapping plumes of different source materials. Rather, as shown by Figures 2 and 3 of Hedström, the approach uses different source materials that are axially positioned and translated with respect to the rotating motion of the substrate 1. As such, explicit claim limitations are still missing from the combination urged by the Examiner. The application of Baron et al. and Hedström to claim 36 therefore should be withdrawn. MPEP § 2143.03.

II.B. Claim 56

The Examiner has applied what appears to be two combinations of four references each under 35 U.S.C. §103(a) to claim 56. Specifically, the Examiner has applied:

(i) Baron et al. (U.S. 4,401,052) in view of Kushiya et al. (U.S. 6,092,669), Chow (U.S. 5,031,229), and Matsuda et al. (U.S. 5,571,749); and

(ii) Baron et al. (U.S. 4,401,052) in view of Hedström (U.S. 5,445,973), Chow (U.S. 5,031,229), and Matsuda et al. (U.S. 5,571,749).

Applicants disagree with the application of these references to the pending claims. First, applicants incorporate by reference any relevant argument above in

Section II.A with respect to Baron et al. in combination with either Kushiya et al. or Hedström.

Second, applicants dispute the propriety of adding each of Chow and Matsuda et al. to the combination for various reasons, one of which is highlighted by reviewing the alleged reason for combining the disclosure of Matsuda et al. Specifically, with regard to Matsuda et al., at page 4, the Examiner states:

> Matsuda et al shows a roll assembly where a substrate strip is fed through an evaporation chamber for chemical deposition. In view of Matsuda et al, it would have been obvious to one of ordinary skill in the art to adapt Baron et al, as modified by Kushiya et al or Hedstrom and Chow, with a roll assembly to feed a strip for a continuous process of the vapor deposition.

Applicants respectfully submit that this is likely yet another instance where hindsight has subtly crept into the reasoning asserted in the Office action. Applicants have reviewed each of Baron et al, Kushiya et al., Hedström, and Chow, and can find nothing that suggests using a roll assembly to allow continuous vapor deposition.

Further, various of these references appear to be incompatible with using a roll assembly. For example, as discussed above, Hedström uses a rotating carrier device, with no disclosure of how it could even be used with a roll assembly. As another example noted above, Kushiya et al. describes a process that uses a glass substrate (see col. 5, ll. 15-16) that is presumably inflexible, and therefore incompatible with a roll assembly.

Applicants therefore respectfully request that the rejection be withdrawn.

II.C. Remaining Claims

While applicants believe that various assertions contained in the Office action with regard to the remaining claims are in error, in the interest of brevity, applicants believe that it is unnecessary to discuss them all at this time. Therefore, since the remaining claims depend from claims already discussed above, applicants respectfully request that the rejection of the remaining claims be withdrawn.

II.D. New Claims

Applicants have added several new dependent claims and request that these claims be allowed.

III. Conclusion

Applicants have made a genuine attempt to respond to the Office action. If there are any questions regarding this paper, or the application as a whole, the Examiner is encouraged to contact the undersigned attorney so that allowance of the claims can be facilitated.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on June 11, 2004.

Pamela A. Knight
Date of Signature: June 11, 2004

Respectfully submitted,

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